Lecture 4

Theories of Decision Making

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PS4168: Economic Psychology

Overview

- Approaches to Studying Decision Making (revision)
- Expected Value/Expected Utility Theory
  - Bayes Theorem
- Prospect Theory
- Social Functionalist Theory
- Dual-Process Theories
- Mental Models

Recap

- Describe 3 nudges
  - ***and*** the theory behind them

Recap

Homo Economicus?

- a rational individual
- makes rational decisions
- that maximize utility
- is self-interested
- capable of learning from experience
- stable, consistent preferences (Ranyard, 2018, p. 6; see also Lea, Tarpy, & Webley, 1987; Wärneryd, 2008)

Approaches to Studying Decision Making

- Normative Theories *versus* Behavioural Theories
- Normative (prescriptive) approaches
  - Influenced by economic and mathematical models of how decisions ***should*** be made
  - Assume people are rational
    - should make the optimal choice (the choice that best reflects the person's preferences)
    - decisions should be consistent across settings
- Behavioural (descriptive) approaches
  - Describe how decisions are made

Defining Rationality

- Epistemic rationality
  - Rational belief or inference
  - Has a conclusion that is true
- Rationality of action
  - Actions (as opposed to beliefs/inferences)
  - Helps to achieve a goal
- **Instrumental rationality**
  - "our mental states or processes are rational when they help us to achieve our goals" (Over, 2004, p. 3)

Expected Value / Expected Utility Theory

Expected Value

- Which gamble would you rather play?
  - **A:** 20% chance of winning €5
  - **B:** 30% chance of winning €4
- Pick the option with the highest *Expected Value*
  - EV = probability of outcome x value of outcome
- EV(A) = 20% x €5 = €1
- EV(B) = 30% x €4 = €1.20
- **B has greater expected value**

Problem with Expected Value

- Not every Euro has the same subjective value
  - Low income: €100 would allow person to eat better food or buy new clothes
  - High income: €100 would not need to be spent on necessities
- Lotteries
  - Pay €1 for a 1/52,000,000 chance to win €10,000,000
    - Expected value of this gamble is less than €1

Expected Utility

- Utility = subjective value
  - represents whatever people want to achieve (Von Neuman & Morgenstern, 1947)
- EU = probability of outcome x utility of outcome
- Lotteries
  - Expected utility of €1 is low - not much you can do with €1
  - Expected utility of the prize is high - could do a lot with that kind of money
    - The low probability of winning does not completely outweigh the high utility of the prize
  - There is also the pleasure in dreaming about winning

Predictions of Expected Utility Theory

- Choices consistent across transformations
  - a: 45% chance of €200 vs b. 50% chance of €150
  - a: 90% chance of €200 vs b. 100% chance of €150
- Preferences stable across measures
  - Do you prefer A or B?
  - Would you pay more for A or B?

Bayes Theorem

$$p(y|x) = \frac{p(x|y)p(y)}{p(x)}$$

Prospect Theory

Prospect Theory

- Kahneman & Tversky (1979; 1974) suggested a more realistic approach to describing decision making.
- Prospect theory highlights the exaggerated weighting of expected losses in people's decision making.
- Decision weights instead of probabilities
  - Decision weights are generally slightly lower than probabilities.
    - Though this changes at low probabilities.

Prospect Theory

- Two people had paid a non-refundable deposit of €100 for a weekend at a resort.
  - On the way to the resort, both of them became slightly unwell, and felt they would probably have a more pleasurable time at home than at the resort.
  - Should they drive on or turn back?

Prospect Theory - Sunk Cost

- Prediction of *loss-aversion*
- The sunk-cost effect:
  - extra expenditure in order to avoid a loss.
- This can occur even when additional expenditure is now on a less preferred option.
  - examples?

Recall:

- Choices consistent across transformations
  - a: 45% chance of €200 vs b. 50% chance of €150
  - a: 90% chance of €200 vs b. 100% chance of €150

Prospect Theory - Risk Aversion

- *Sure* gains are chosen over *risky* but possibly greater gains.
  - This is termed **risk aversion**.
- ***BUT***

Prospect Theory

- Given the choice of either Option A or Option B below, which one would you go for?
  - a: A sure loss of €800
  - b: An 85% chance of losing €1000, with a 15% chance of losing nothing.

Prospect Theory - Risk Aversion/Seeking?

- Risk aversion can be transformed into risk seeking.
  - We are more likely to take a chance to avoid a loss than we are to make a gain.

Prospect Theory - Practical applications

- Banks et al. (1995) studied the effectiveness of two videotapes in persuading women to undergo a mammogram.
- Same medical facts presented on both tapes, but one emphasised gains of undergoing a test, the other the risks of not undergoing one.
- More of those who watched the risk-focused tape obtained a mammogram in the following 12 months.

Prospect Theory

(Kahneman & Tversky, 1979, p. 279)

Prospect Theory

(Kahneman & Tversky, 1979, p. 283)

Social Functionalist Theory

Social Functionalist Theory

- Tetlock (2002) suggests that we need a more socially aware model of the decision maker.
- Rather than an intuitive *economist* or intuitive *scientist* we might consider:
  - Intuitive politician
  - Intuitive prosecutor
  - Intuitive theologian

Booking a Holiday 1

- You have a chance to by a very cheap holiday to Italy, but you must today.
- You have just recently taken an exam, but you don't know yet whether you've passed or failed.
  - Buy the holiday.
  - Don't buy the holiday.
  - Pay €5 so you can still buy the holiday at the cheap price in two days time.

https://vevox.app/#/m/107169906

Booking a Holiday 1 Results (link)

Booking a Holiday 2

- You have a chance to by a very cheap holiday to Italy, but you must today.
- You have just recently taken an exam, and found out that you've passed.
  - Buy the holiday.
  - Don't buy the holiday.
  - Pay €5 so you can still buy the holiday at the cheap price in two days time.

https://vevox.app/#/m/137212716

Booking a Holiday 2 Results (link)

Booking a Holiday 3

- You have a chance to by a very cheap holiday to Italy, but you must today.
- You have just recently taken an exam, and found out that you've failed.
  - Buy the holiday.
  - Don't buy the holiday.
  - Pay €5 so you can still buy the holiday at the cheap price in two days time.

https://vevox.app/#/m/109337883

Booking a Holiday 3 Results (link)

Intuitive Politicians

(making ourselves accountable)

- We are accountable to "a variety of constituencies".
- Sometimes we must be prepared to offer explanations to maintain relationships, or maintain others' perceptions of us.
- The presence of others and the resources for explanation can affect decision making.

Intuitive Prosecutors

- Certain contexts can trigger patterns of decision making that involve more punitive (or less lenient) actions.
- Tetlock et al. (2007) found that a situation where norms have been violated lead to a range of emotional and attributional effects on decision making.
- Strong interactions with conservative vs. liberal beliefs.

Intuitive theologians

- Being an intuitive theologian means acting as though decisions should flow from some higher authority.
- Strong ethical considerations can overwhelm base-rate information.
  - *moral outrage*

Activity

- In Groups:
  - Please Identify an example when you acted as
    - an intuitive politician
    - an intuitive prosecutor
    - an theologian:

What are Dual-Processes?

- System 1 *versus* System 2 (Stanovich, 1999, 2005)
- intuitive / heuristic *versus* analytic (Chaiken, 1980; Evans, 1989, 2006, 2007)
- automatic *versus* controlled (Schneider & Shiffrin, 1977)
- experiential *versus* rational (Epstein, 1994; Epstein & Pacini, 1999; Pacini & Epstein, 1999)
- implicit / tacit *versus* explicit (Evans & Over, 2013; Reber, 1989)
- associative *versus* rule-based (Sloman, 1996; Smith & DeCoster, 2000)
- for reviews see Evans (2010); Evans (2008); and Kahneman (2011)
- Parallel / interventionist / competing / conflict ??

Features of Dual-processes

- Consciousness
- Evolution
- Functional
- Individual differences

- (Evans, 2008, p. 257)

Consciousness

System 1	System 2
Cluster 1 (Consciousness)	
Unconscious (preconscious)	Conscious
Implicit	Explicit
Automatic	Controlled
Low effort	High effort
Rapid	Slow
High capacity	Low capacity
Default process	Inhibitory
Holistic, perceptual	Analytic, reflective

(adapted from Evans, 2008, p. 257)

Evolution

System 1	System 2
Cluster 2 (Evolution)	
Evolutionarily old	Evolutionarily recent
Evolutionary rationality	Individual rationality
Shared with animals	Uniquely human
Nonverbal	Linked to language
Modular cognition	Fluid intelligence

(adapted from Evans, 2008, p. 257)

Functional

System 1	System 2
Cluster 3 (Functional characteristics)	
Associative	Rule based
Domain specific	Domain general
Contextualized	Abstract
Pragmatic	Logical
Parallel	Sequential
Stereotypical	Egalitarian

Individual differences

System 1	System 2
Cluster 4 (Individual differences)	
Universal	Heritable
Independent of general intelligence	Linked to general intelligence
Independent of working memory	Limited by working memory capacity

Dual Processes and Other Variables

- Cognitive Capacity
  - Individual differences (Barrett, Tugade, & Engle, 2004; Brünken, Steinbacher, Plass, & Leutner, 2002)
  - Manipulated/nature of task (De Neys & Schaeken, 2007; Trémolière, Gagnon, & Blanchette, 2016)
- Construal level and Distancing (Ayduk & Kross, 2010; Fujita, Henderson, Eng, Trope, & Liberman, 2006; Liberman, Sagristano, & Trope, 2002; van Dijke, van Houwelingen, De Cremer, & De Schutter, 2017)
- Need for Cognition
  - "to engage in and enjoy effortful analytic activity" (Cacioppo & Petty, 1982; Forsterlee & Ho, 1999, p. 471)

Dual-processes in Action

Influencing Decisions

- Cognitive Load Manipulations (Deck & Jahedi, 2015)
  - Increased load inhibits System 2
- Results
  - To more risk-averse behavior
  - More impatience over money
  - More susceptible to specific biases (anchoring effects)

Dual-processes in Action

Inhibiting Stereotypes

- Stereotypes lead to prejudices
  - Prejudices are inevitable (Devine, 1989)
- But not all stereotypes are *acceptable*
- System 1 perceives the stereotype
  - causing the prejudice
- System 2 attempts to inhibit the prejudice
- Stereotypes are automatically activated ***but*** personal beliefs require conscious activation

Dual-processes in Action

Inhibiting Stereotypes

3 Studies (Devine, 1989):

- Study 1:
  - Method:
    - Prejudice measured using the Modern Racism Scale (McConahay, Hardee, & Batts, 1981)
    - Knowledge of Stereotypes measured by open-ended *"list components of stereotype"*
  - Results:
    - No relationship between stereotype knowledge and level of prejudice

Dual-processes in Action

Inhibiting Stereotypes

- Study 2:
  - Method:
    - Prejudice measured using the Modern Racism Scale
    - Stereotypes primed using word lists
    - Judged ambiguous behaviours
  - Results:
    - Evaluation of ambiguous behaviours consistent with stereotype
    - No difference in stereotype activation for high vs low prejudice participants

Dual-processes in Action

Inhibiting Stereotypes

- Study 3:
  - Method:
    - Prejudice measured using the Modern Racism Scale
    - Participants reported *"all of their thoughts"* on the target group
  - Results:
    - Low prejudice responses were less consistent with stereotypes than high prejudice participants
    - People can (sometimes*) monitor and inhibit the influence of automatically activated stereotypes

Limitations of Dual-Process Theories

- Separable systems/processes? (e.g., Mugg, 2015)
- A continuum? (e.g., Alós-Ferrer & Strack, 2014)
- Exclusivity? Switching? (De Neys, 2023)
- Logical intuitions? (De Neys, 2012; Ghasemi, Handley, Howarth, Newman, & Thompson, 2022; Raoelison, Boissin, Borst, & De Neys, 2021)
- How do they work together?

Mental Models

Mental Models

- Proposed by Philip Johnson-Laird (Johnson-Laird, 1983, 2006)
- "Mental models" are descriptions of how we represent information
- A "Mental Model" differs from a "Full model"
  - Incomplete
  - Laziness/cognitive ease

Mental Models

You are permitted to carry out only one of the following two actions:

Action 1: Take the apple or the orange, or both.

Action 2: Take the pear or the orange, or both.

Are you permitted to take the orange?

(Bucciarelli, Khemlani, & Johnson-Laird, 2008; Johnson-Laird, 2006)

Mental Models

Action 1	Action 2
Take the apple	Take the pear
Take the orange	Take the orange
Take both the apple and orange	Take both the pear and orange

Figure 1: mental_models

Mental Models

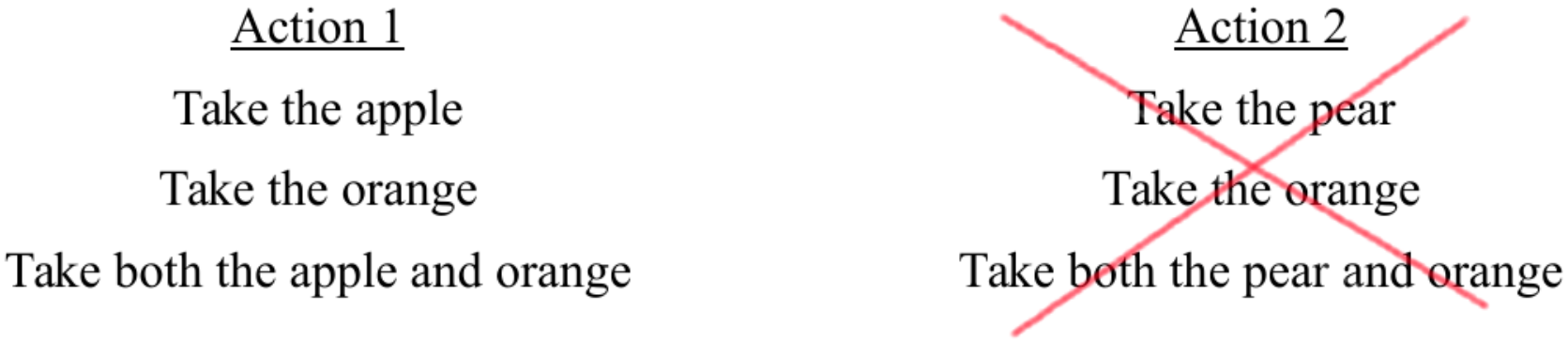


Figure 2: mental_models

Mental Models

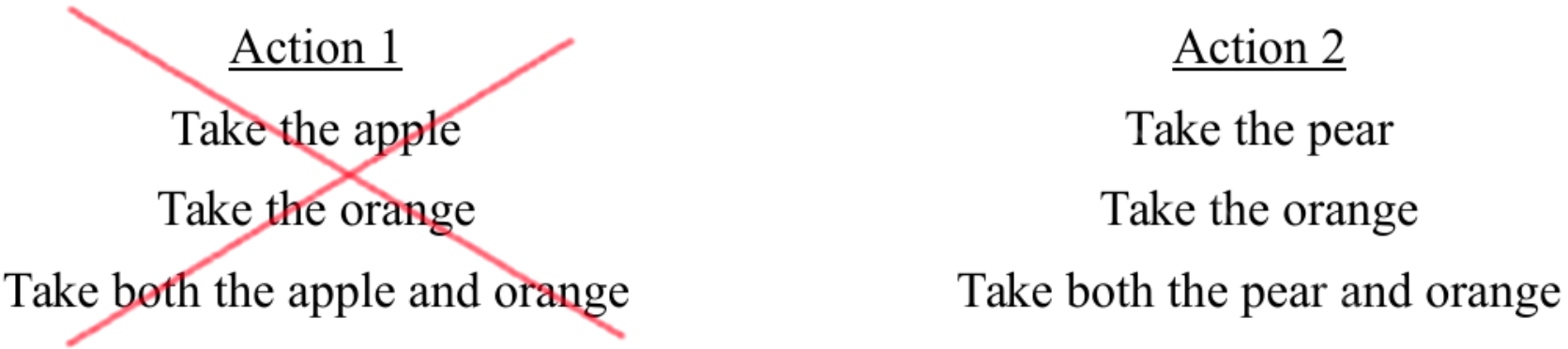


Figure 3: mental_models

Complete Models

Action 1	Action 2
Take the apple	~~Take the pear~~
(Take the orange)	~~Take the orange~~
Take both the apple (and orange)	~~Take both the pear and orange~~

Figure 4: mental_models

Complete Models

Action 1	Action 2
~~Take the apple~~	Take the pear
~~Take the orange~~	(Take the orange)
~~Take both the apple and orange~~	Take both the pear (and orange)

Figure 5: mental_models

Mental Models

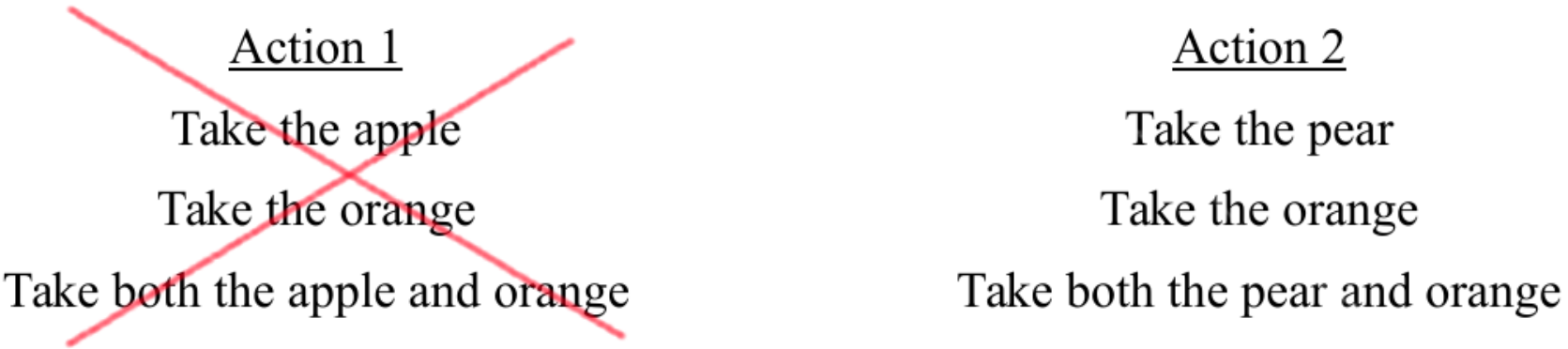


Figure 6: mental_models

Mental Models and Incomplete Information

- *All of the napkins are blue*

Mental Models and Incomplete Information

- *All of the napkins are blue*

napkin blue

napkin blue

napkin blue

blue

Mental Models and Incomplete Information

- *if there's a lily in the vase then there's a rose*

Mental Models and Incomplete Information

- *if there's a lily in the vase then there's a rose*

Figure 8: mental_models

Mental Models and Incomplete Information

- *if there's a lily in the vase then there's a rose*

lily

rose

. . .

Figure 9: mental_models

Mental Models and Spatial Relations

- *the knife is on the right of the fork, and the napkin is on the left of the knife*

(Byrne, 2015)

Mental Models and Spatial Relations

- *the knife is on the right of the fork, and the napkin is on the left of the knife*

Napkin Fork Knife

Figure 10: mental_models

Mental Models and Alternative Possibilities

- *the knife is on the right of the fork, and the napkin is on the left of the knife*
- Is the fork is on the right of the napkin?

Mental Models and Alternative Possibilities

- *the knife is on the right of the fork, and the napkin is on the left of the knife*

Napkin	Fork	Knife
Fork	Napkin	Knife

Mental Models and Alternative Possibilities

- *the knife is on the right of the fork, and the napkin is on the left of the knife*
- Is the fork is on the right of the napkin?

Napkin Fork Knife

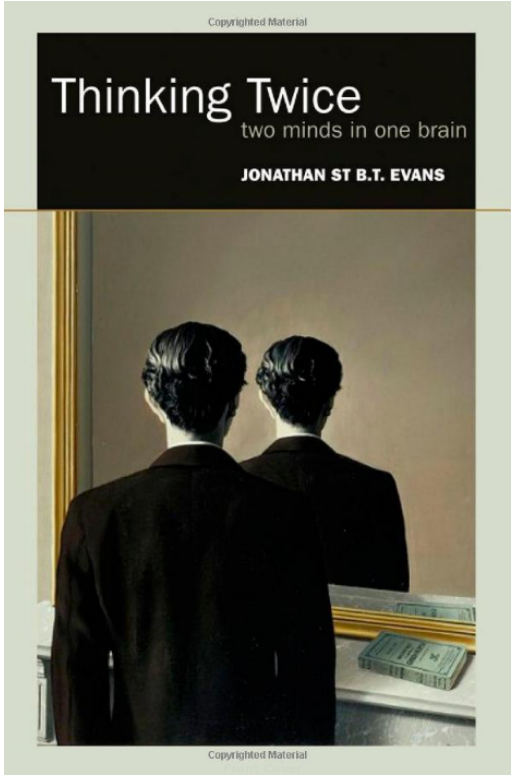
Fork Napkin Knife

Uses of Mental Models

- Counterfactuals (if)
- “Logical” conclusions
- Counter examples
- Everyday reasoning

- Mental model is “generated” by System 1 but System 2 “uses” it

Further Reading



(Evans, 2010)

Figure 11: mental_models

Activity

- In Groups:
  - Evaluate the theories of decision Making discussed
    - listing strengths and limitations of each

References

References

Alós-Ferrer, C., & Strack, F. (2014). From dual processes to multiple selves: Implications for economic behavior. *Journal of Economic Psychology*, *41*, 1–11. https://doi.org/10.1016/j.joep.2013.12.005

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